ELEC 533
Introduction to Random Processes and Applications

Behnaam Aazhang

MWF 11:00-11:50 am for online synchronous lectures and discussions

Lecture notes and videos are online

Fall Semester, 2020
Electrical and Computer Engineering

This is a graduate course on random processes, which is designed to prepare students for graduate work in communications, networking, signal processing, neuroengineering, data science, and computer systems. The course covers basic concepts and useful analytical tools for engineering problems involving discrete and continuous-time random processes.

- ***Review of Basic Probability***: Probability spaces, random variables, distribution and density functions, expectation, characteristic functions, conditional probability, conditional expectation.

- ***Sequences of Random Variables***: Convergence concepts, laws of large numbers, central limit theorem.

- ***Random Vectors and Estimation:*** Random vectors, covariance characterization jointly Gaussian random variables.

- ***Basic Concepts of Random Processes:*** Definition and classification, stationarity and ergodicity, correlation functions, continuity, differentiation, and integration of random processes.

- ***Random Processes in Linear Systems:*** Spectral analysis of random processes in linear systems, the orthogonality principle.

- ***Special Processes:*** Markov processes, Wiener Process, Poisson processes, shot noise, thermal noise.

- ***Spectral Representation of Random Processes:*** White-noise integrals, expansion of random processes.

- ***Applications:*** Signal detection, classification, feature extraction, and parameter estimation

Prerequisite: An introductory course in probability and some background in linear algebra.

Recommended Textbooks: A textbook is not required. Copies of class notes is provided.

- R.G. Gallagher, Stochastic Processes: Concepts for Applications pdf online
- R.G. Gallagher, Discrete Stochastic Processes, 2nd edition pdf online
- W.B. Davenport, Probability and Random Processes
- J.B. Thomas, An Introduction to Applied Probability and Random Processes

- E. Wong and B.E. Hajek, Stochastic Processes in Engineering Systems
- R. Ash, Real Analysis and Probability

HW's 20% + Quiz 20% + 1st exam 30% + 2nd exam 30% = 100 %

Graders:

- To be announces

Also, the first two books can be found in .pdf format in Resources.

ELEC 533 Timetable

Assignment	Due Date	Grader
Labor Day	September 7	
Homework 1	September 10	
Homework 2	September 17	
Quiz:	September 24	
Homework 3	October 1	
Homework 4	October 8	
Homework 5	October 22	
First Examination:	October 29	
Homework 6	November 5	
Homework 7	November 12	
Homework 8	November 19	
End of classes	November 20	
Second Examination:	December 3	